

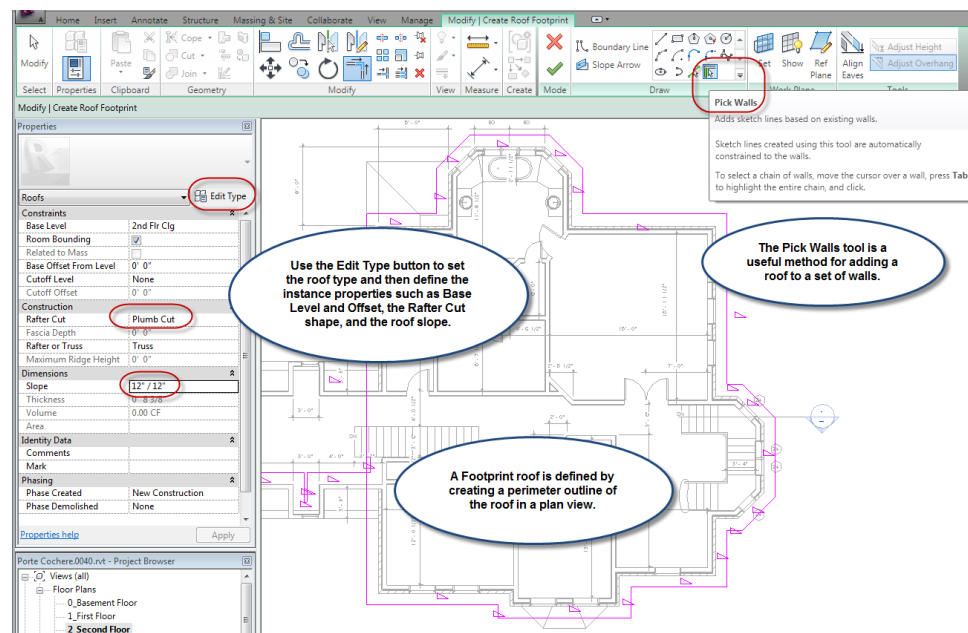
AGENDA:

1. Creating and Modifying Footprint Roofs
2. Joining Roofs and Attaching Walls
3. Extruding Roofs and Adding Dormers

1. Creating and Modifying Footprint Roofs

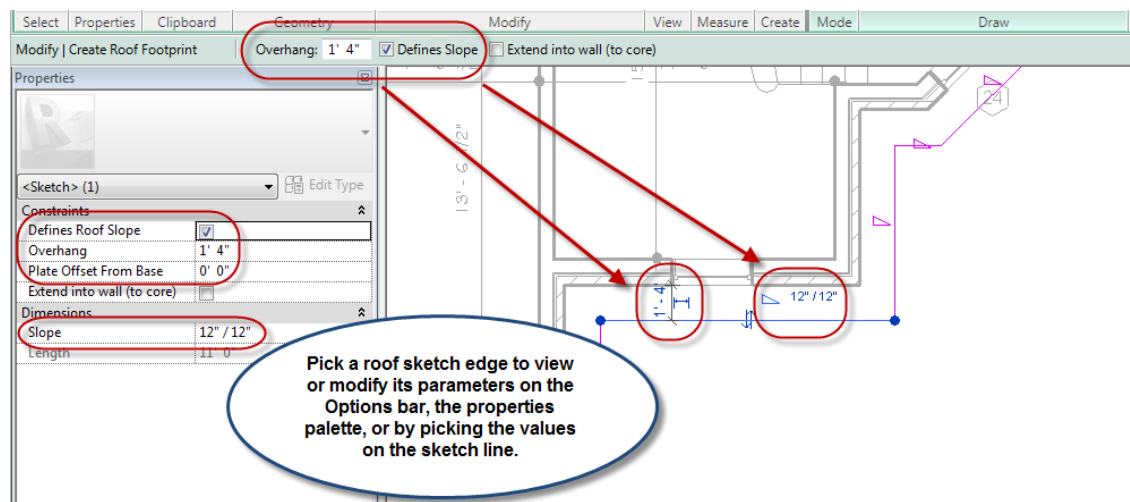
Roof elements in Revit may be defined with a Footprint or as an extrusion. Complex, curved roofs may also be created by deriving the roof from the Face of a massing model.

The most common method of creating a roof is the footprint method in which you specify the outline of the roof perimeter, usually in a plan view. The footprint can be defined by picking walls, by drawing lines or a combination of both methods. The perimeter sketch of a footprint roof must form a closed loop. Any inner loops inside the roof perimeter will define holes or openings in the roof.



The footprint sketch is defined at the level of the Plan view which is current when you draw the sketch unless you specify a different base level in the Roof properties. For example you can draw the perimeter sketch in the Second Floor level but set the roof to be constrained to the Second Floor Ceiling level.

As you sketch a roof footprint, the Options Bar displays a Defines Slope toggle as well as an Overhang distance. These values may be changed as you are creating the footprint or after the main footprint has been defined. When you turn off the Defines Slope option for a roof segment, that section of roof will extend vertically creating a gable roof.

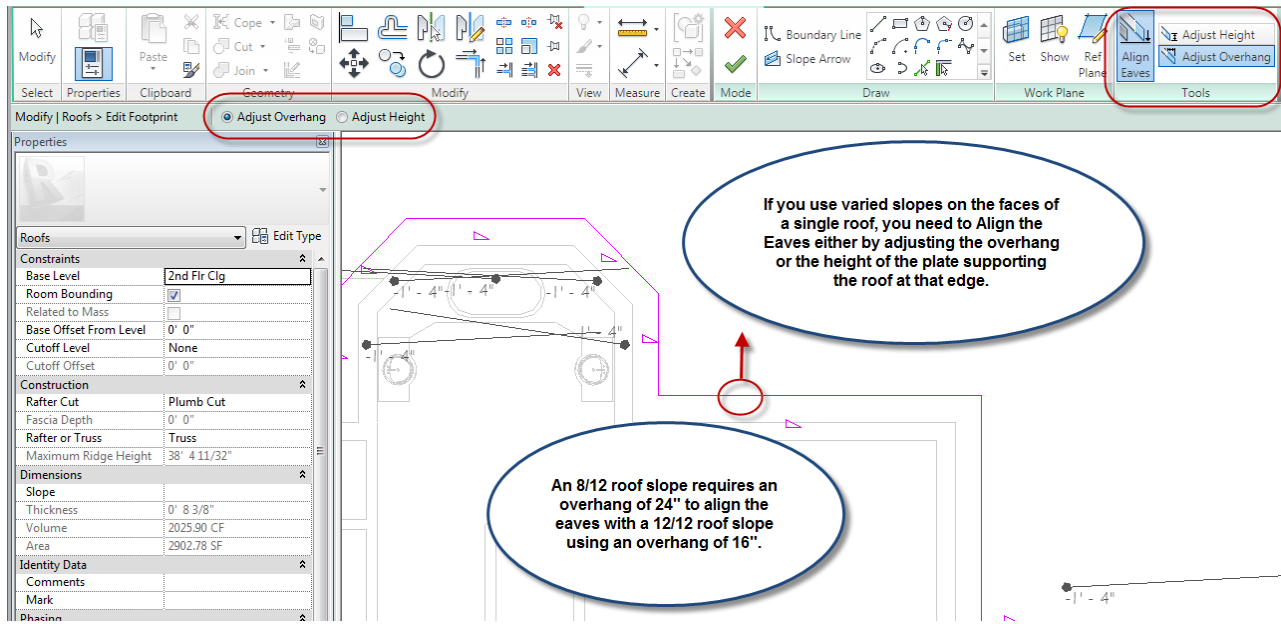


toggling the define slope option for various segments of a roof sketch will define different types of roofs. Turn off the define slope on all sides and you get a flat roof. Turn it on all sides and you get a hip roof. Each time you turn off the slope for a selected edge of a complex footprint, that edge will form a gable so it is easy to create a roof with a combination of hip and gable sections.

When you first define the roof footprint, you can use the Properties palette to set the Base level, an offset from the base level, construction options, and the slope for all segments of the roof that are defined with a slope line.

A footprint roof can also have different slopes for different faces. When you pick a single edge in the footprint sketch, the slope value as well as the overhang distance for that segment will be displayed. If you pick the dimension for the overhang or the rise over run slope indicator, you can modify the values. This would let you define a hip roof with a 12/12 slope on the sides and a lower 8/12 slope on the back face of the roof, lowering the overall height of the roof and modifying the appearance of the roof line. When you introduce varying slopes on a roof, the roof properties dialog displays an empty field for the slope. Entering a value will apply that slope to all segments.

When you apply different roof slopes to adjoining faces of a roof, the eaves component of the roof will no longer be aligned. The eaves position is defined through a combination of roof overhang distance, wall height, and roof slope or angle.



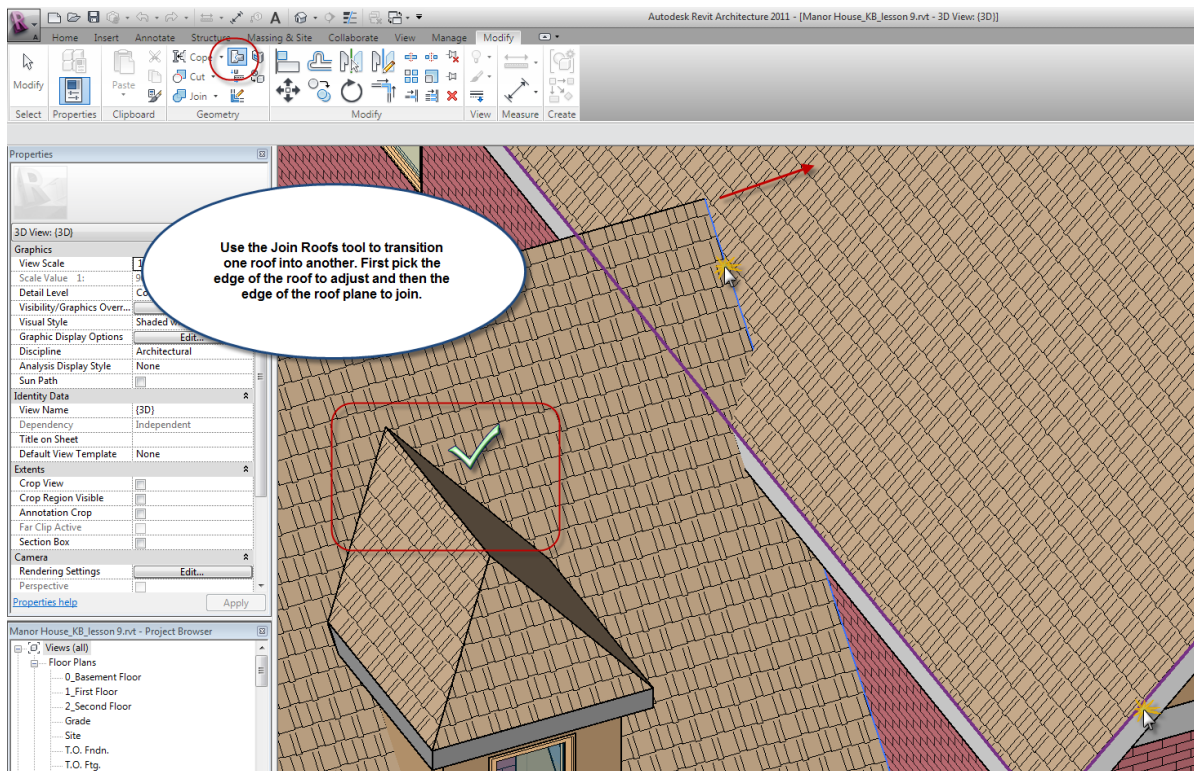
The Align Eaves tool may be accessed when you are creating the roof or after it has been created and modified, by picking the Roof and then selecting the Edit button on the Options Bar to go back to the roof sketch mode. Pick Align Eaves, select a roof edge that you want to align to and then pick the edge that you wish to align. The overhang distance will be adjusted and when you pick Finish Roof to exit sketch mode, the roof eaves will be aligned.

Eaves may be defined with different rafter end cuts which will modify the size and shape of the eaves. If you want a vertical face on the ends of the rafters, choose a Plumb Cut or a two-Cut Plumb shape. If you want the ends of the rafters to be aligned perpendicular to the slope of the roof, choose Two cut Square.

Choosing a Two cut method opens up a value for a Fascia Depth which can be specified between zero and the thickness of the roof. This is useful for reducing the depth of the exposed eaves. A plumb cut eave on a 12/12 roof with an 8" thickness will create an eaves depth of over 11". Setting a Plumb Two cut will allow you to reduce that distance to 8" or 6".

2. Joining Roofs, and Attaching Walls

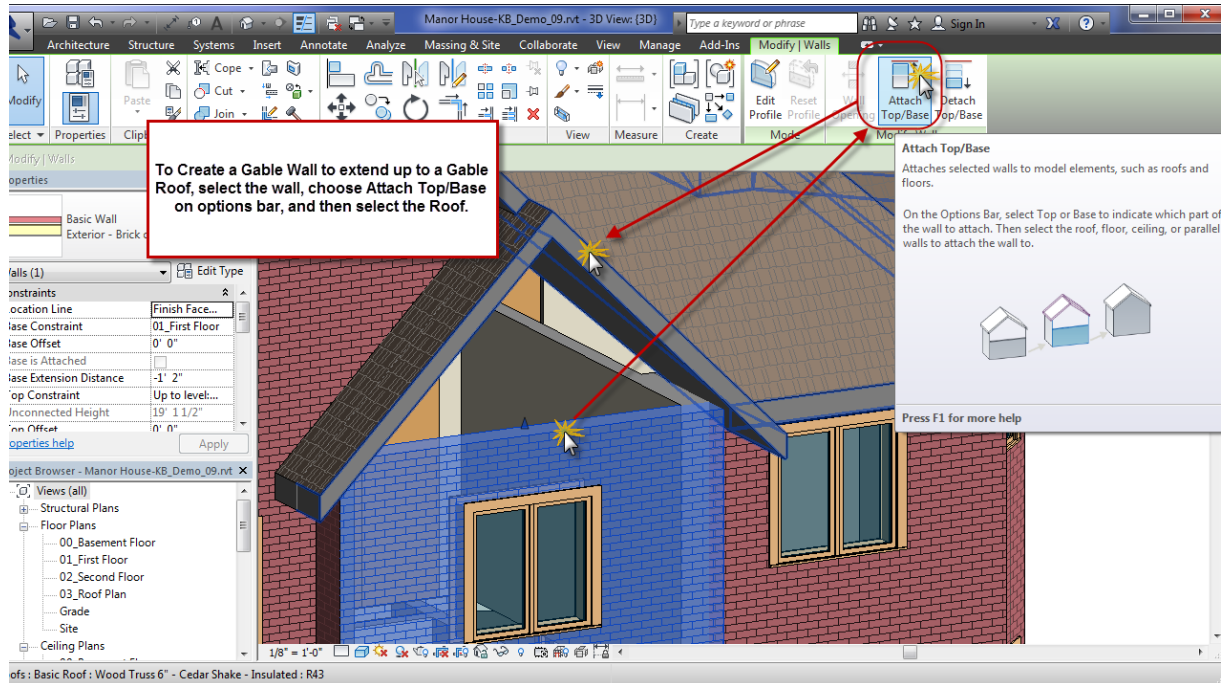
Roof elements may be joined together to create a connection between a vertical edge on one roof and a sloping face on an adjacent roof with the Join Roofs tool.



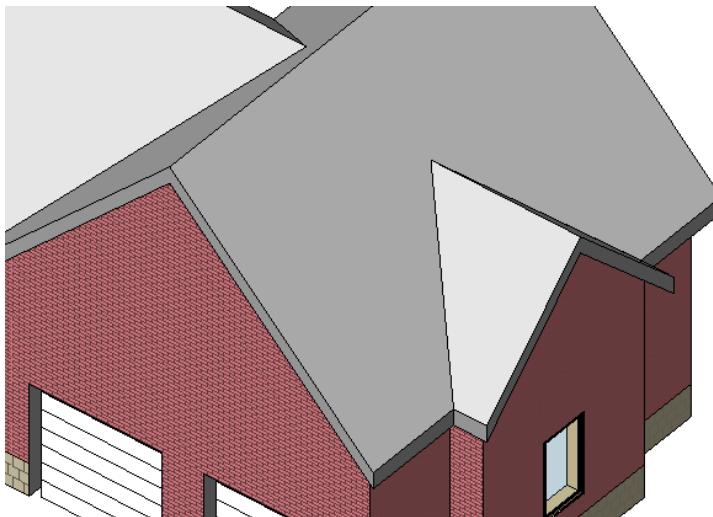
To Join roofs, obtain a 3D view in which you can see an edge on the minor roof to be joined and a face defining edge on the adjacent major roof. From the Geometry panel on the Modify tab of the Ribbon, pick Join Roofs, Pick a vertical edge on the minor roof and then pick the edge of an adjacent roof face. Easy as 1, 2, 3. 😊

The Join Roofs command cannot be applied to walls. Use the attach option for walls. The Unjoin Roofs tool lets you reverse a Join roofs operation. Just pick the tool and pick one of the joined edges where the minor roof meets the major roof face. It is possible to join a roof to the top face of an adjacent roof and the wall below if you select the wall as the "attach to" target. This will only work if the target wall is already attached to a footprint type roof above.

If you want walls to extend up to a roof or to trim off where they protrude through a roof, select the walls and on the options bar pick Attach and then select the roof. When a wall is attached to a roof, it will change height automatically if the roof is modified or repositioned.



After attaching a wall to a roof, you can use the Detach option to return it to its original height. In some instances, attaching a wall to a roof will not yield the desired result, especially around short jogs in gable walls. In these instances you may need to edit the wall profile manually to obtain the desired results.



Detach the wall from the roof or just pick the wall and choose Edit Profile to automatically remove all attachments while you modify the shape of the wall in an elevation view.

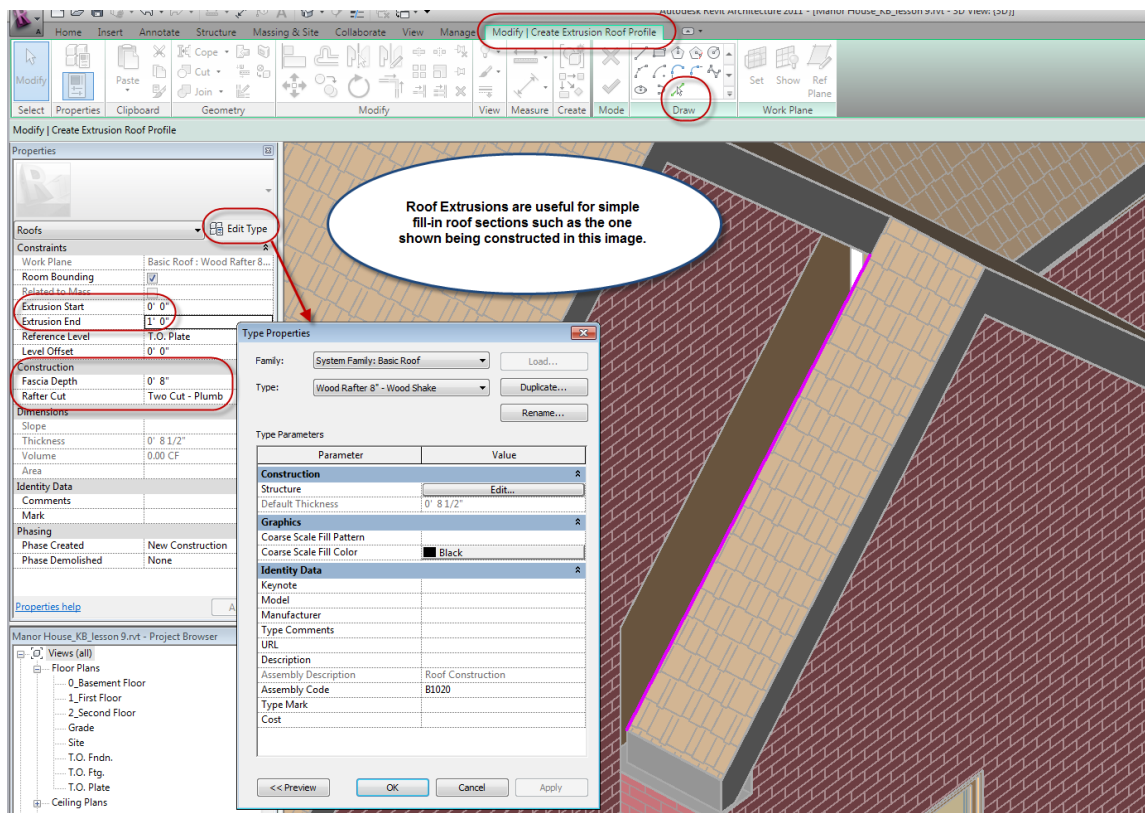
3. Extruding Roofs, and Adding Dormers

Roof Extrusions allow you to define a roof with an open curve of lines and/or arc segments.

Extruded Roofs support the same compound structure available in footprint roofs.

The open profile will define the top edge of the roof and the extrusion properties will let you define the depth.

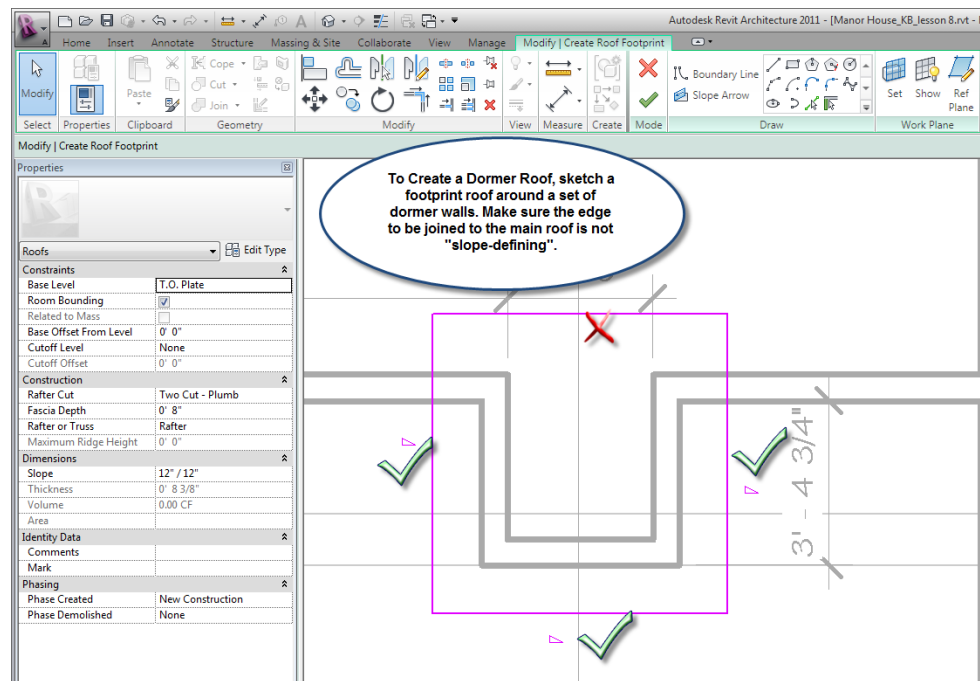
Extruded Roofs allow you to create simple dormer roofs, arch dormers, eyebrow dormers as well as sections of roof fill pieces for things like gable returns.



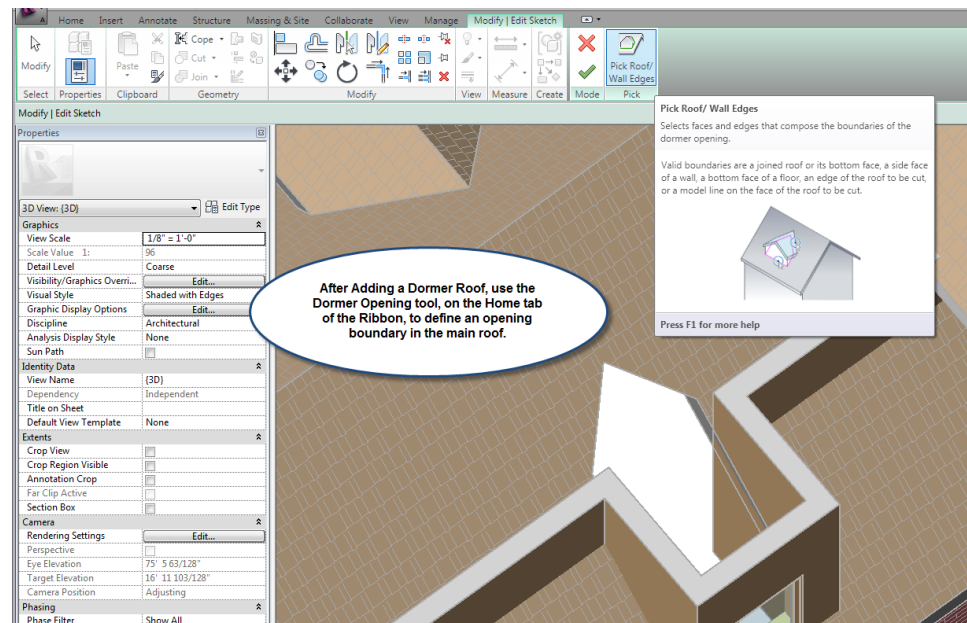
When you choose the Roof by Extrusion option, you will be prompted to define a work plane in which to draw the sketch. This plane will also set the start location for the extrusion.

If you don't specify the extrusion depth, Revit will estimate the depth for you based on the size of the project extents and the size of the sketch.

To create a Dormer roof, you create a small roof, usually over a set of dormer walls and then join the dormer roof to the main roof. Dormer openings can be created by sketching a closed loop inside the perimeter of the main roof sketch or with the Dormer Opening tool. You can sketch the footprint by picking walls on three sides and then adding the back edge with a line.



After defining the Dormer roof, you also need to cut a Dormer opening in the main roof. Openings may be created in a plan view or elevation view where you can see the main roof face as well as the dormer roof shape and dormer walls.



The final step in the creation of a Dormer will be to edit the profiles for the sidewalls of the dormer to close the small openings below the roof.

Exercise Notes

In the following exercise we will continue to develop the Manor House project, adding two main roof sections on the first and second floors, a small roof over the laundry room and two dormer roofs in the Den over the Porte Cochere.

1. Open the Manor House project and switch to the View tab. Create a new floor plan view which references the Top of Plate 2. level. Make this level current and rename the plan view to 03_Roof Plan but do not rename the level. The second floor walls should be visible as an underlay. The interior walls over the garage and Porte Cochere should be in place for this exercise.
2. From the Build panel on the Ribbon, choose Roof / By Footprint. On the options bar set the Overhang to 1'-4" and confirm that Defines Slope is selected. Move your cursor over one of the main second story exterior walls and press Tab to highlight the entire chain of walls. Pick the wall to create a full perimeter sketch in one step. If necessary, add lines or trim corners to create closed boundary
3. Pick the Edit Type button on the Properties Palette. In the Type pulldown, select the Wood Rafter 8" – Asphalt Shingle – Insulated type. Choose Duplicate and call the new type Wood Truss 6" – Wood Shake. Pick Ok and then pick the Edit button by structure to open the Edit Assembly dialog. In layer 4, change the Material to Structure Wood Joist / Rafter and set the thickness to 5 1/2". In Layer 1 change the Material to Roofing – Wood Shake and set the thickness to 5/8". Leave the Substrate layer as 5/8" plywood sheathing and pick OK. Pick OK again to finish creating the new roof type.
4. The current roof slope as indicated by selecting a sketch edge is 9/12. Let's change this to 12/12. In the Dimensions section of the Properties Palette, set the Slope to 12/12. Confirm the base elevation is Top of Plate 2. and the base offset is 0". Leave the rafter cut at Plumb Cut and the Rafter or Truss set to Truss. Pick the checkmark on the ribbon to finish the sketch.
5. Pick Finish Sketch and if prompted to attach the selected walls to the roof, pick NO. We do want the exterior walls to be connected to the roof but not the interior walls. Switch to a 3D View and take a look at the Hip roof we have just created.

6. We need to make two, gable sections at the front walls of the house. It is possible to edit a roof sketch in a 3D view as well as a plan view. Switch to a Southwest isometric view and zoom in on the hip roof faces at the very front of the house.
7. Select the roof and from the Ribbon choose Edit Footprint to switch into Sketch mode. Pick one of the front edges going from East to West and on the Options bar, clear the check mark by Defines slope. Pick the next horizontal edge where we want a gable roof, right click and choose Toggle Slope Defining from the cursor menu. Pick Finish Sketch.
8. Choose No if prompted to attach the walls to the roof automatically. For a simple gable roof, this is where we would like to attach the wall to the roof. Float your cursor over one of the exterior walls and when it highlights, press TAB to select the entire chain. Pick to select all of the walls in the chain, and from the Modify Wall panel on the Ribbon, pick Attach Top/Base. Pick the roof and if prompted to remove a reference dimension, pick yes. The Gable ends do fill in but the result will need to be modified by editing the wall profile in the next class. Hit CTRL-Z to undo the operation.
9. Switch to the South elevation view. When you're creating a roof, it is a good idea to look at in the elevation views, especially the Front elevation, so you can get a read on what the roofline is going to look like and also how tall the roof is getting.
10. Zoom in on the eaves at the right side of the roof. Draw a dimension from the top edge to the bottom edge of the vertical eaves section. The fascia depth is about 9 1/2". Delete the dimension.
11. Zoom out and then zoom back in to the eaves at the left side of the roof where you can see the shape of the end of the angled member. Move your mouse over the roof until it highlights and then pick the roof. Pick Element Properties and set the Rafter Cut to Plumb Two Cut and the Fascia depth to 6". Pick OK. Go back to the right side of the roof and redraw the dimension you created in step 10 to confirm it is now 6" as specified.
12. Zoom back out to where you can see the entire roof. It is very high at the main ridge. If you draw a dimension from grade to the peak you'll see it is over 41 feet tall. Pick the roof and in the Properties Palette change the Slope to 6/12 and pick OK.

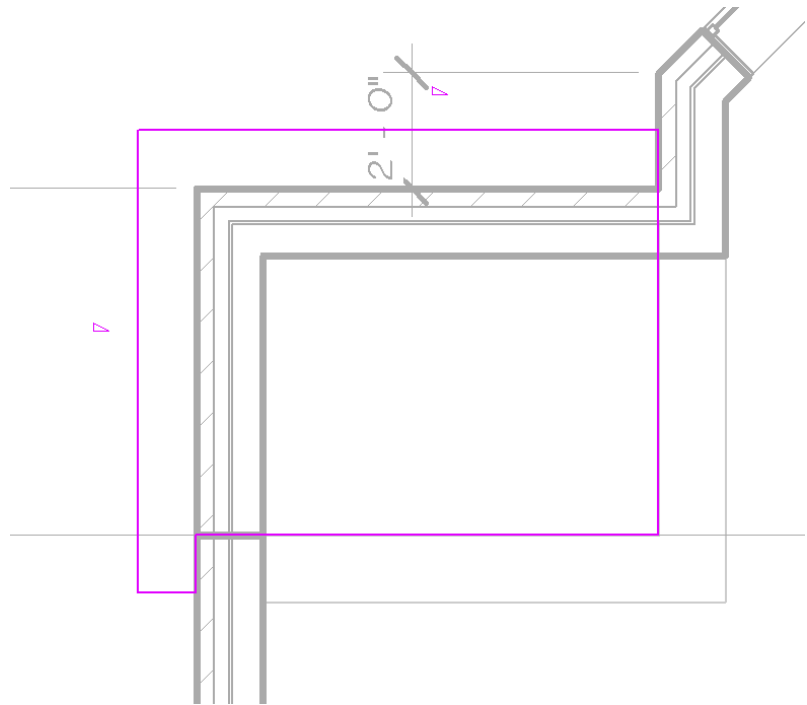
13. AGGGHHH! It looks terrible to have a low pitch on such a grand house. Change the slope to 9/12 and check it again. If you draw a dim from grade to peak you see it is just over 36 feet which is more reasonable but it would look better with the steep pitches on the side. The solution is to drop the slope on the back face of the roof where the lower angle will only be visible in a side elevation.
14. Set the slope for the roof back to 12/12. Switch to the Roof Plan view. Pick the Roof and on the Ribbon pick Edit Footprint to go back into sketch mode. Pick the horizontal line to the right of the bay section at the back of the house. Pick the slope indicator which is showing 12/12 and change the value to 8/12. Repeat for the corresponding horizontal section to the left side of the bay.
15. When we adjust the slope on selected faces of a roof to create a multi-slope roof, we need to align the eaves before finishing the sketch. Otherwise it may not be possible to create the roof. From the Sketch bar, pick the Align Eaves tool and Adjust Overhang. A number of leaders and distances will be displayed showing the current eaves height. If you zoom in to the back of the roof you can see that the eaves height for the two sections we just modified is now -1'-0" instead of -1'-4". Even if the roof can be created, the eaves height will vary by 4 inches in this area. Pick one of the roof segments with the -1'-4" eaves height and then pick the two segments with the -1'-0" eaves height. The overhang distance increases and the eaves should now align. Pick finish roof and if any dims are reported as invalid, remove the references.
16. Switch back to the South Elevation and check the height of the roof above grade. 39 feet is the allowable roof height for this area, so at 38'-3", we can keep the new configuration.
17. Switch to a 3D view and change your viewing direction until you can see the back corner where we dropped the walls to the first story around the laundry room. If the walls in this area are extending up to the roof, select them and choose Detach Top/ Base.
18. Switch to the Second Floor view and zoom in around the laundry room. Make sure your underlay setting in the View Properties dialog is set to display the first floor walls.
19. From the Build panel, choose Roof / By Footprint. Set the overhang to 1'0" and the slope of the roof to 12/12 so it matches the pitch on the main roof. Set the Base Level to Top of Plate 1. Set the rafter cut to Two Cut Plumb and the fascia depth to 6".

20. Sketch the roof footprint as shown in the image at right. The return section is 1'-0" long and only the two main lines will define a slope.

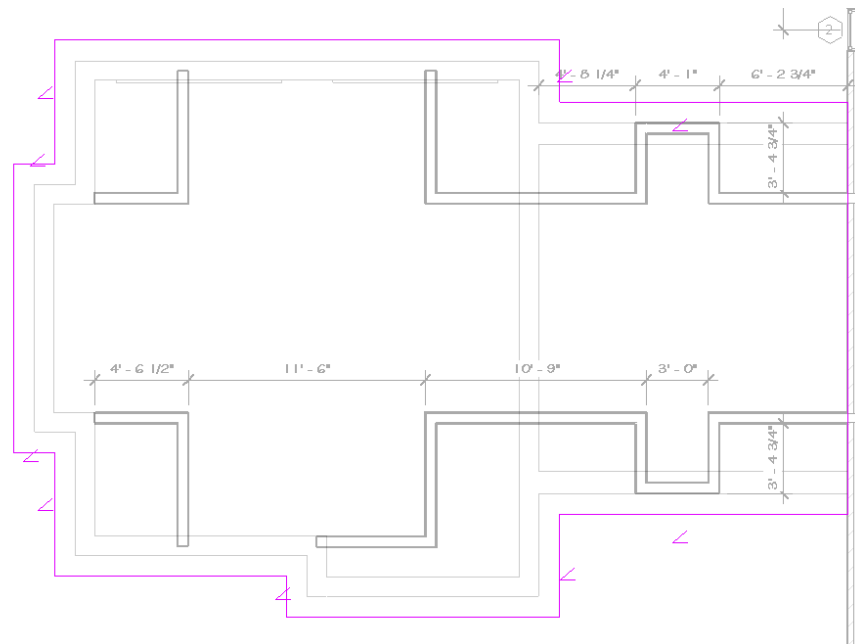
21. Switch to a 3D view and zoom in on the laundry roof. Looking very nice but the roof is bit extensive. Change the slope to 8:12 to lower the roof. That looks better. :) There may be a small notch in the outside wall corner above the roof. We will fix this with an in-place model in an upcoming class.

22. Check the West elevation to see how the roofline looks from the side view. Switch back to the Second Floor view and zoom out over the garage and porte cochere. It is time for the fun part.

23. Creating a roof which will extend up from the first floor and encompass a living space on the second floor, within the roof confines is always a tricky proposition but Revit can make the process easy. After creating the roof and letting it cut through the walls you can create section views to help you check ceiling heights and available headroom and get a look at the space you are proposing, from the inside out. Turning a section view into a 3D section also allows you to examine the connections from any viewing direction.

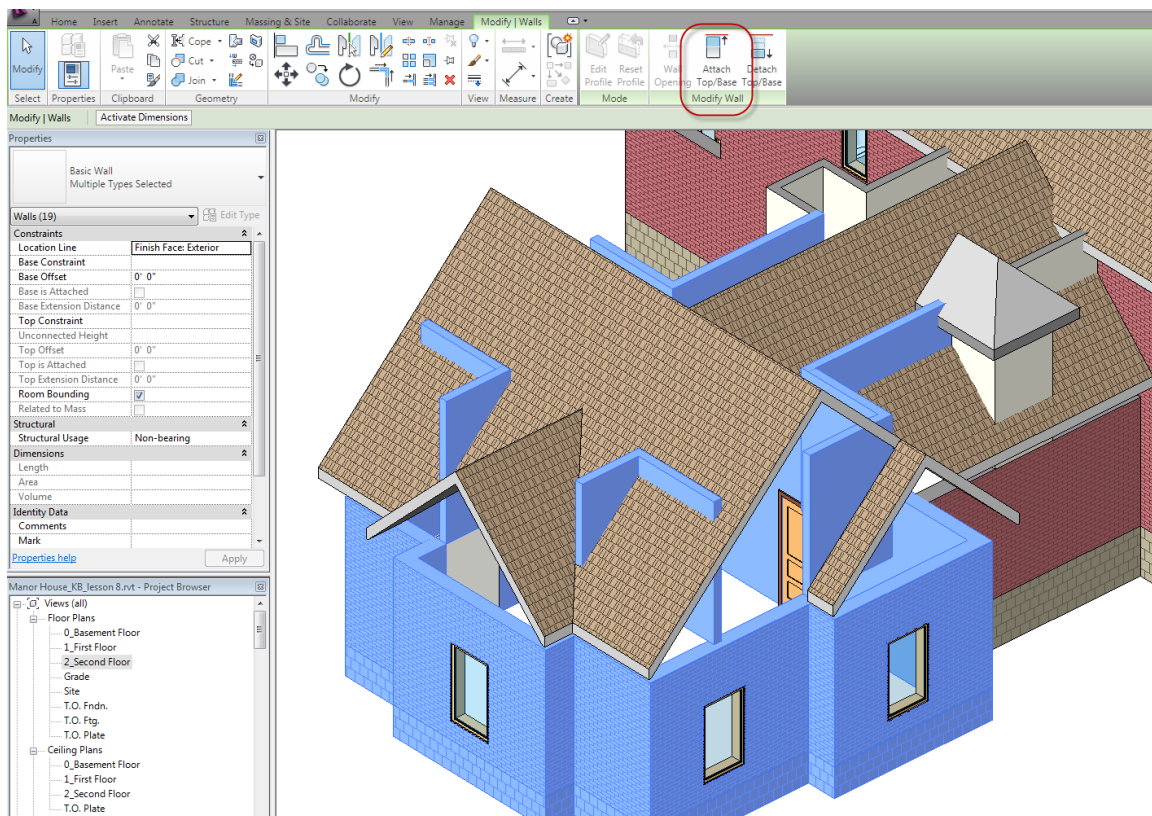


24. Create a Roof by Footprint which encompasses the walls of the garage and the porte cochere and attaches to the wall of the main house. If you do a chain selection for the garage, you can split the sketch line on the right side and connect it to two lines drawn 1' 4" from the Porte cochere walls. Use dimensions to help place the lines you draw if required.
25. Add one more line along the brick wall of the house to close the loop. Turn off the slope defining for the line against the house. There will be four gable sections on the garage. Toggle the slope defining off for the edges as shown below.



26. Open Roof Type Properties and Duplicate the Wood Truss type. Create a new type called Wood Rafter 8" – Insulated – Wood Shake. Edit the assembly to change the thickness of the rafter to 7 1/4" and change the material to match the name. Pick Ok.

27. Set the Base level to 2nd floor and the base offset from level to 2'-0". Set the Rafter Cut to Two-Cut Plumb and the Fascia depth to 6". Set the slope to 12"/12". Pick Finish Roof and if prompted, say no when prompted to attach the walls to the roof. We'll pick the ones we want to attach in another step so we can save the dormer walls. If you get an error instead of an offer to attach walls, examine your sketch and try redrawing any lines that may not be connected properly.
28. Switch to a Southwest isometric view and do a chain select of the exterior garage walls. Press CTRL and add the interior walls on the second floor over as far as the dormers. From the Ribbon bar, choose Attach and then pick the new roof. *You will get a warning about overlapping walls caused by the first floor exterior wall overlapping the interior partition above. Accept the warning and continue.*



29. Select the 6 dormer walls plus the 4 adjacent walls connecting to the dormer walls. Set their top offset to -2'-0" to lower them to a 7 foot height.

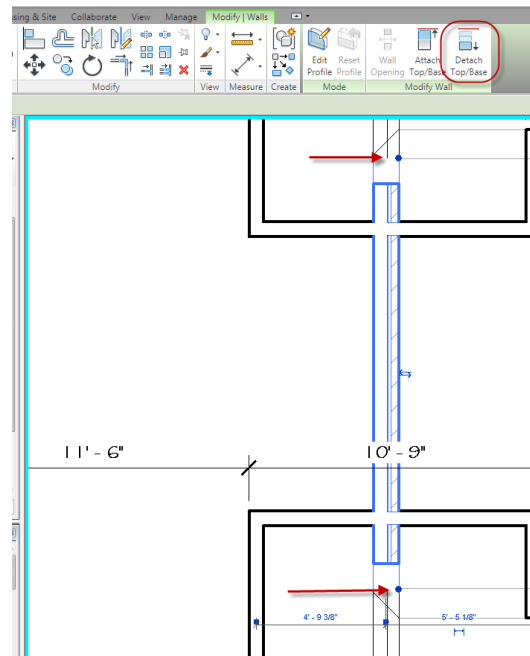
30. Switch to a second floor view and we can see the most serious problem where a wall from the first floor has now attached to the roof and is cutting through the entrance to the guest suite. Use the split tool to break this wall into three segments. Pick the middle segment as shown at right and choose Detach and then Detach all from the Options Bar.

31. Switch to the 03_Roof Plan. view and zoom in over the dormer at the front of the house. Pick the roof over the porte cochere and from the view control bar choose Hide Element.

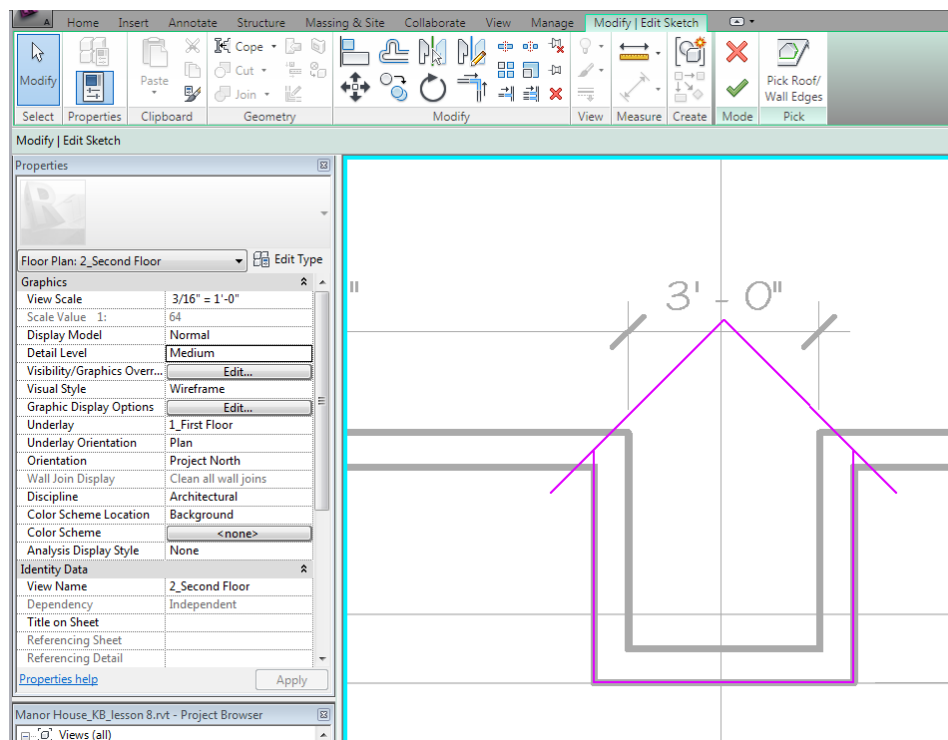
32. Create a new wall type by duplicating the 6 ½" partition and editing the structure to change the gypsum wall board on exterior to ½" on ½" plywood sheathing. Assign to all 6 dormer walls.

33. Create a Roof / By Footprint with a 6" overhang and a 12"/12" slope around the dormer walls. Set the Roof properties so the Base Level is at 2nd Flr. Clg. and the Base Offset is set to -2'-0". Set the Rafter Cut to Two Cut and the Fascia depth to 6". Pick OK and then Finish Sketch to create the roof.

34. Switch to a3D view and zoom in to where you can see the dormer roof next to the main garage roof. Pick the Join Roofs tool and then pick an edge at the back of the dormer. Pick another edge along the adjacent, main roof face.



35. We need to make a cut in the roof where we can access the dormer. From the Architecture tab on the Ribbon, choose Opening / Dormer Opening. Pick the main roof and then pick the dormer roof to start the sketch where the two roofs intersect. Switch to the second floor plan view, and pick the dormer walls to add three more segments. Drag their endpoints or use Trim to clean up the corners of the sketch. The sketch lines along the roof can overhang the parallel edges in this type of sketch as shown below, or you can trim the corners to form a closed loop. Choose Finish Boundary to complete the dormer opening.



36. Switch to a 3D view and use the temporary hide control to hide the dormer roof so you can examine the cut. Repeat Steps 30 to 35 to add the second dormer roof and dormer opening.
37. Save and close the project. We will continue to develop the roof and wall elements and connections in the next class.

